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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/901,580	07/11/2001	Gonzalo Wills	2500.370	4799

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EXAMINER	
PRITCHETT, JOSHUA L	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 07/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/901,580	WILLS ET AL.
	Examiner	Art Unit
	Joshua L. Pritchett	2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This action is in response to Amendment after non-final rejection filed January 25, 2005. Claims 1, 18 and 19 have been amended as requested by the applicant.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doerr (US 6,304,380).

Regarding claim 1, Doerr teaches an isolated polarizing beam splitter/combiner comprising a first portion (400-2) for launching a beam of light into the splitter/combiner, or for outputting (400-1) a combined beam of light from the splitter/combiner; second (500-1) and third (500-2) spaced apart ports for launching orthogonally polarized beam of light into the splitter/combiner for combining and outputting to the first port, or for outputting (500-1 and 500-2) orthogonally polarized beam of light which were input together at the first port; a first polarization beam splitter (BF-1) optically coupled to the first port to provided different optical paths for two orthogonally polarized beams of light; a second polarization dependent beam

steering means (BF-2) optically coupled to the second and third ports to provide different optical paths for two orthogonally polarized beams of light; a non-reciprocal rotator (45 DEG.) for rotating a polarization of each of the two orthogonal beam of light and maintaining the orthogonal relationship between them when passing therethrough in one direction, while having substantially no cumulative effect on the polarization in an opposite direction, said non-reciprocal rotator adapted to be drive for transmission in a selected combining direction or a splitting direction (col. 4 lines 39-59), wherein light propagates from the second and third ports simultaneously to the first port and prevents light from coupling between the first port and the second and third ports (Fig. 3) and wherein light propagates from the first port simultaneously to the second and third ports and prevents light from coupling between the second and third ports and the first port (Fig. 3). Doerr lacks the rearrangement of the second beam steering element and the rotator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to rearrange the second beam steering element and the rotator, since it have been held that a mere rearrangement of element without modification of the operation of the device involves only routine skill in the art. One would have been motivated to rearrange the second beam splitter and the rotator for the purpose of directing the light propagating from the second and third ports to the same port that launches light toward the second and third ports, thus eliminating the need for the port 400-1.

Regarding claim 2, Doerr teaches the first and second beam splitter elements comprising a first and second birefringent element (col. 4 lines 39-59).

Regarding claim 3, Doerr teaches the first and second birefringent elements are located in object space of image space (Fig. 3).

Regarding claim 4, Doerr teaches the non-reciprocal rotator comprises a Faraday rotator (co. 4 liens 46-47).

Regarding claim 5, Doerr teaches the non-reciprocal rotator further comprises a half wave plate ($\lambda/2$).

Claims 6-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doerr (US 6,304,380) in view of Xie (US 6,212,008).

Doerr teaches the invention as claimed but lacks reference to the claimed orientation of the splitter/combiner elements. Xie teaches wherein the non-reciprocal rotator provides a rotation of zero degrees in a selected direction and provides a rotation of 90 degrees in a reverse direction (implicit); wherein the first birefringent element and the second birefringent element have rotational axes oriented substantially parallel or antiparallel to each other (implicit); wherein at least one of the first birefringent element and the second birefringent element has an axis oriented for maximum walk-off between the different optical paths (see Fig. 12); wherein the first birefringent element and the second birefringent element have rotational axes oriented at substantially 45 degrees to each other and the Faraday rotator proves a rotation of 45 degrees (see Fig. 12: second non-reciprocal rotator 646), wherein the first birefringent element and the second birefringent element have rotational axes which together with a rotation of the non-reciprocal rotator provide efficient coupling in a transmission direction between the different optical paths of the first birefringent element and the different optical paths of the second birefringent element while substantially preventing coupling in an isolation direction (see Fig. 12)., wherein the first birefringent element has an o-ray path and an e-ray path and the second

birefringent element has an e-ray path and an o-ray path such that the e-ray path of the second birefringent element is optically couple with the o-ray path of the first birefringent element and the o-ray path of the second birefringent element is optically couple with the e-ray path of the first birefringent element, wherein the different optical paths for two orthogonally polarized beams of light passing through both the first and second birefringent elements have a substantially same optical path length (see Fig. 12); wherein the first and the second birefringent elements are substantially of a same optical length (see Fig. 12)., further comprising a third birefringent element and a second non-reciprocal rotator between the second birefringent element and the third birefringent element (see Fig. 12). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the Doerr invention include the orientation of the elements as taught by Xie for the purpose of efficiently separating the light beams into two orthogonal polarizations and combining two orthogonal polarizations.

Claims 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xie et al. (6,212,008 B1) in view of Fukushima (6,507,422 B1).

Xie et al. disclose the invention as claimed--an isolated splitter/combiner for combining orthogonally polarized beams of light into a single port in a polarizing optical beam combining direction, or for splitting a beam of light into orthogonally polarized beams of light to spatially separated ports in a splitting direction comprising: a single port (Fig. 12, 606) for launching a beam of light into the splitter/combiner, or for outputting a combined beam of light from the splitter/combiner; a pair of spaced apart ports (id., 602, 604) for launching orthogonally polarized beams of light into the splitter/combiner, or for outputting orthogonally polarized

beams of light from the splitter/combiner, a first polarization beam splitter (622) optically coupled to the single port, oriented to provide difference optical paths for two orthogonally polarized beams of light; a second polarization dependent beam steeling means (640A, 6408) optically coupled to the pair of spaced apart ports, oriented to provide different optical paths for two orthogonally polarized beams of light; a non-reciprocal rotator (626) between the first polarization beam splitter element and at least an element of the second polarization dependent beam steeling means for rotating a polarization: of each of two orthogonal beams of light and maintaining the orthogonal relationship between them (see Fig. 12), said non-reciprocal rotator adapted to be driven for transmission in a selected combining direction or a splitting direction, wherein when driven in the combining direction, the non-reciprocal rotator permits light to propagate from the pair of ports to the single port, and prevents light from coupling between the single port and the pair of ports, or wherein when driven in the splitting direction, the non-reciprocal rotator permits light to propagate from the single port to the pair of ports, and prevents light from coupling between the pair of ports and the single port (see Fig. 12), further including teachings of the following: wherein the first polarization beam splitter element and the second polarization dependent beam steering means comprise a first and a second birefringent elements (as above); wherein the first and second birefringent elements are located in object space or image space (see Fig. 12)., wherein the non-reciprocal rotator comprises a Faraday rotator (626: col. 5, 11. 60); wherein the non-reciprocal rotator provides a rotation of zero degrees in a selected direction and provides a rotation of 90 degrees in a reverse direction (implicit); wherein the first birefringent element and the second birefringent element have rotational axes oriented substantially parallel or antiparallel to each

other (implicit); wherein at least one of the first birefringent element and the second birefringent element has an axis oriented for maximum walk-off between the different optical paths (see Fig. 12); wherein the first birefringent element and the second birefringent element have rotational axes oriented at substantially 45 degrees to each other and the Faraday rotator proves a rotation of 45 degrees (see Fig. 12: second non-reciprocal rotator 646), wherein the first birefringent element and the second birefringent element have rotational axes which together with a rotation of the non-reciprocal rotator provide efficient coupling in a transmission direction between the different optical paths of the first birefringent element and the different optical paths of the second birefringent element while substantially preventing coupling in an isolation direction (see Fig. 12)., wherein the first birefringent element has an o-ray path and an e-ray path and the second birefringent element has an e-ray path and an o-ray path such that the e-ray path of the second birefringent element is optically couple with the o-ray path of the first birefringent element and the o-ray path of the second birefringent element is optically couple with the e-ray path of the first birefringent element, wherein the different optical paths for two orthogonally polarized beams of light passing through both the first and second birefringent elements have a substantially same optical path length (see Fig. 12); wherein the first and the second birefringent elements are substantially of a same optical length (see Fig. 12)., further comprising a third birefringent element and a second non-reciprocal rotator between the second birefringent element and the third birefringent element (see Fig. 12); wherein a pair of output/input sub-ports at the different optical paths of the first birefringent element have a separation "dl" and wherein the second and the third spaced apart ports of the second birefringent element have a separation "d2" which is greater than or equal to "d1" (see Fig. 12), wherein "dl " is substantially equal to

"d2/2" (see Fig.12)- EXCEPT FOR an explicit teaching wherein said non-reciprocal rotator adapted to be driven for transmission in a selected combining direction or a splitting direction permits light to propagate from said pair of ports simultaneously to said single port, and prevents light from coupling between said single port and said pair of ports, or wherein when driven in said splitting direction, said non-reciprocal rotator permits light to propagate from said single port simultaneously to said pair of ports, and prevents light from coupling between said pair of ports and said single port. (Emphasis added.) Fukushima, however, discloses a teaching of driving non-reciprocal rotators (FR: see col. 10,11. 58-67-col. 11, lines 1-64). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the invention of Xie et al. such that said non-reciprocal rotator, when driven for transmission in a selected combining direction and, alternately, when driven in a splitting direction, Fukushima providing a teaching of driving (biasing) a non-reciprocal rotator to achieve a desired discrimination between beams in an optical device, for at least the purpose of achieving a desired discrimination between said orthogonally polarized beams of light transiting said isolated polarizing optical beam splitter/combiner.

Response to Arguments

Applicant's arguments, see Amendment, filed January 25, 2005, with respect to the rejection(s)of claim(s) 1 under Xie have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Doerr.

Applicant's arguments filed January 25, 2005 have been fully considered but they are not persuasive.

On pages 10-12 of Amendment applicant argues that the Xie reference cannot meet the claim limitations because the Xie reference is an optical circulator while the current application is directed to a splitter-combiner. The limitations of claim 24 are sufficiently broad to allow the optical circulator of Xie to meet the claimed limitations of the splitter-combiner. Furthermore the use of the term, "or," allows the for the interpretation of the claims to require that only one of the conditions set forth for each of the elements be satisfied to meet the claimed limitations. If the applicant wishes to for both conditions to be met the examiner suggests changing the term, "or," to the term, "and." Also claim 24 does not require the simultaneous propagation of claim 1.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Delisle (US 6,711,311) teaches the use of two optical beam steering elements separated by a rotator to separate two orthogonally polarized light beams.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua L. Pritchett whose telephone number is 571-272-2318. The examiner can normally be reached on Monday - Friday 7:00 - 3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JLP

DREW A. DUNN
SUPERVISORY PATENT EXAMINER